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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04Q 11/04, 3/00 — A1

(11) International Publication Number: WO 99/53715

(43) International Publication Date: 21 October 1999 (21.10.99)

(21) International Application Number: PCT/FI99/00265

(22) International Filing Date: 30 March 1999 (30.03.99)

(30) Priority Data:
980729 31 March 1998 (31.03.98) FI

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(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.

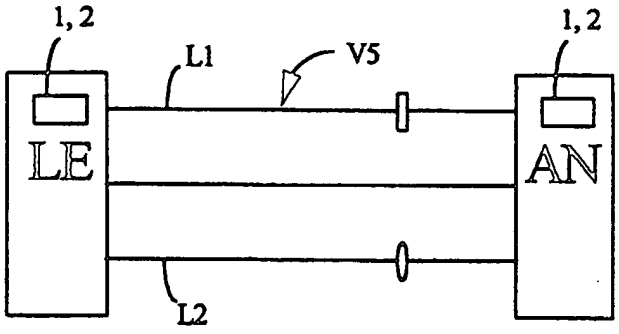
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

In English translation (filed in Finnish).

(54) Title: METHOD FOR ENSURING THE OPERATION OF SIGNALLING CHANNELS IN A V5 INTERFACE

(57) Abstract

The invention relates to a method and a system for ensuring the operation of signalling channels in a V5 interface established between a local exchange (LE) and an access node (AN). According to the invention, the switch–over of any signalling channels is prevented until the V5 interface has been completely started up. This ensures that, after the start–up of the V5 interface, both ends of the interface will be functioning in accordance with the same configuration setting.



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METHOD FOR ENSURING THE OPERATION OF SIGNALLING CHANNELS IN A V5 INTERFACE

The present invention relates to a method as described in the preamble of claim 1 and to a system as described in the preamble of claim 5 for ensuring the operation of signalling channels in a V5 interface established between a local exchange and an access node during start-up of the interface.

Open interfaces (V5.1 and V5.2) between an access network or an access node and a local exchange are defined in the ETSI (European Telecommunications and Standards Institute) standards of the ETS 300 324 and ETS 300 347 series. V5 interfaces enable subscribers belonging to a physically separate access network to be connected to a telephone exchange using a standard interface. In the present application, V5 interface expressly refers to a dynamic concentrator interface (V5.2) defined in the ETS 300 347 standard series. It consists of one or more (1 - 16) PCM (Pulse Code Modulation) lines. One PCM line comprises 32 channels, each of which with a transfer rate of 64 kbit/s, i.e. 2048 kbit/s altogether. The V5.2 interface supports analogue telephones as used in the public telephone network, digital, such as ISDN (Integrated Services Digital Network) basic rate and primary rate interfaces as well as other analogue or digital terminal equipment based on semi-fixed connections.

Certain time slots in the V5 interface form a channel called C-channel, which carries the protocols used to control the interface itself and the calls transmitted through it. The information transmitted in the C-channel, or in a 64 kbit/s time slot reserved for this purpose, may pertain to the V5 interface Control protocol, Link control protocol, Protection pro-

tocol or BCC protocol or it may consist of PSTN signalling or ISDN signalling.

According to the above-mentioned standards, a C-channel may be reserved for time slots 16, 15 and/or 31 in a PCM line or V5 interface link. Especially in the V5.2 interface, the system automatically creates C-channels for the critical protocols (Control, Link control, BCC and Protection). However, the operator can place PSTN signalling as desired, in the same channel with the critical protocols or in some other C-channel. In addition, the operator may allocate at most three signalling channels for use as so-called standby channels.

The standby channels are taken into use when a malfunction occurs in the link to which the channels have originally been allocated. In a V5.2 interface, which has more than one w Mbit/s links, the link whose physical C-channel in time slot 16 carries the Control, Link control, BCC and Protection protocols is defined as the primary link. Further, the link whose physical C-channel in time slot 16 carries only the Protection protocol is a secondary link. The configuration of the V5 interface is indicated by a Provision Variant parameter. The Provision Variant parameter is used in conjunction with the start-up of the interface to select a certain configuration, which defines the placement of the protocols described above, i.e. the channel used to carry each protocol in the V5 interface.

Fig. 2 presents a signal flow diagram which exemplifies a certain problem associated with the start-up procedure of the V5 interface. During the start-up procedure, certain protocols are activated, whereupon the interface is in an Inservice condition. Fig. 2 illustrates the starting up of the protocols in sequence, the Protection protocol being the first protocol to be started up. The system management program

block instructs the Protection protocol program block to start up the Protection protocol. The other protocols are started up in the same way. Finally, the PSTN restart process is started. In a normal situation after PSTN restart, the V5 interface is in the Inservice condition. However, as shown in Fig. 2, the PSTN restart process may be interrupted due to many reasons, which are known to the skilled person. Interruption of the restart process is represented by arrow A in Fig. 2. Similarly, due to a lightning or other disturbance occurring during the start-up of the interface, there may appear a short break in the ISDN channel, with the consequence that a switch-over of the ISDN channel is carried out. This is done because the Protection protocol is already running and takes care of this protective action, which is part of its function. The switch-over is identified at both ends of the interface, so the original configuration indicated by the Provision variant parameter has changed.

If the PSTN restart process is not completed at both ends of the interface, then that end at which the process is interrupted will activate the restart process. In conjunction with restart, the original configuration indicated by the Provision variant parameter is also adopted, with the result that one end of the interface has a configuration with channel switch-over while the other end has the original configuration. Therefore, after the interface has been started up, no ISDN calls can be transmitted because the messages of the ISDN protocol are not passed through the V5 interface in consequence of crossed channels.

The standard does not define any mechanism for the detection of the above-described situation although this situation prevents the transmission of calls from ISDN subscribers who have been configured to use the ISDN signalling channel referred to.

The object of the present invention is to eliminate the problem described above. A specific object of the present invention is to disclose a method and system for ensuring that the start-up of a V5 interface is correctly performed and that the situation in the interface after start-up is normal and correct even if there should be disturbances in the interface during start-up.

As for the features characteristic of the invention, reference is made to the claims.

In the method of the invention for ensuring the operation of signalling channels in a V5 interface comprising at least two links between a local exchange and an access node during start-up of the interface, a faulty signalling channel is switched over from a first link to a second link. According to the invention, all standard switch-overs of signalling channels in Protection Group 2 are prevented until the V5 interface is in a normal operational condition. `Signalling channel' in this context may refer to C-channels of Protection Group 2 and their switch-over, and the signalling channel may be an ISDN signalling channel or a PSTN signalling channel. The method ensures that, after start-up of the V5 interface, both ends of the interface are working in accordance with the same configuration setting and no conflicts arise.

As compared with prior art, the present invention provides the advantage of eliminating status conflicts between the ends of a V5 interface resulting from channel switch-overs occurring during start-up of the interface. Thanks to the invention, the V5 interface will function normally after a restart even if there should be problems during the first start-up.

If during start-up the part of the V5 interface at the local exchange or the part at the access node initiates a switch-over of ISDN or other signalling channels, then the part of the interface at the

other end will prevent the switch-over or refuse to accept it if it thinks that it has not yet been started up into the normal operational condition.

The system of the invention for ensuring the operation of signalling channels in conjunction with the start-up of a V5 interface comprises a local exchange, an access node and a V5 interface disposed between the local exchange and the access node to connect them. The V5 interface comprises at least two links, allowing a faulty signalling channel to be switched over from a first link to a second link in accordance with the interface configuration settings. According to the invention, the system comprises means for preventing the switch-over of any signalling channels until the V5 interface has been completely started up, thus ensuring that, after the start-up, both ends of the V5 interface will function in accordance with the same configuration settings originally defined. As stated above, 'signalling channel' may refer to any C-channel in Protection Group 2.

In a preferred embodiment, the system comprises means for monitoring the interface start-up phase. Such means are preferably provided at both ends of the interface, i.e. in the local exchange and in the access node, because either end may start a channel switch-over, which has to be prevented if the interface has not been completely started up.

In the following, the invention will be described by the aid of a preferred embodiment with reference to the attached drawing, wherein

Fig. 1a - 1d illustrate a potential conflict situation during start-up of a V5 interface; and

Fig. 2 presents a signalling diagram.

The figures present a diagrammatic illustration of a system according to the invention, comprising a local exchange LE and an access node AN. Disposed between these is a V5 interface V5, which com-

prises at least two links L1 and L2. In addition, both ends of the V5 interface V5, i.e. both the local exchange LE and the access node are provided with means 1 for preventing the switch-over of any signalling channels and means 2 for monitoring the start-up of the interface.

Fig. 1a illustrates a normal original situation where link L1 has been configured as an ISDN signalling channel. Link L2 is a standby channel to which the ISDN signalling channel can be switched over. Fig. 1b represents a situation after a failure when a malfunction has occurred in link L1 and the ISDN signalling channel is switched over to link L2.

If the interface is still in the start-up phase and the part of the interface at the local exchange LE has not yet been started up, then the situation is as presented in Fig. 1c and 1d. The access node AN thinks the channel configuration is such that ISDN signalling is carried by link L2, Fig. 1c. The local exchange LE thinks that the ISDN signalling channel is link L1, because the local exchange did not recognise the channel switch-over as it considered that the interface had not yet been completely started up, so, because of the failure, it has performed a restart in the original configuration.

The above-described situation can be effectively avoided by monitoring the start-up phase of the interface between the local exchange and the access node, using means 1, 2. In practice, the monitoring of the start-up of the interface and the switch-over of channels are implemented by issuing from the System management program block an instruction to the Protection protocol program block to disable the switch-over of any channels belonging to Protection Group 2 until both ends of the interface have been started up.

The invention is not restricted to the examples of its embodiments described above, but many

variations are possible within the scope of the inventive idea defined in the claims

CLAIMS

1. Method in a V5 interface established between a local exchange (LE) and an access node (AN), said interface comprising at least two links (L), for ensuring the operation of signalling channels during start-up of the V5 interface, in which method a faulty signalling channel is switched over from a first link (L1) to a second link (L2), characterised in that the switch-over of any signalling channels is prevented until the V5 interface is in a normal operational condition, thus ensuring that, after the start-up of the V5 interface, both ends of the interface will be functioning in accordance with the same configuration setting.

2. Method as defined in claim 1, characterised in that, if the part of the V5 interface at the local exchange (LE) or the part at the access node (AN) initiates a switch-over of ISDN signalling channels during start-up, then the part of the V5 interface at the other end will prevent the switch-over if it thinks that it has not yet been started up.

3. Method as defined in claim 1 or 2, characterised in that the interface configuration parameter is the V5 interface Provision Variant parameter defined in the V5 specifications.

4. Method as defined in claim 3, characterised in that in restarting the V5 interface the original Provision Variant parameter is used.

5. System for ensuring the operation of signalling channels during start-up of a V5 interface, said system comprising

a local exchange (LE),

an access node (AN) and

a V5 interface disposed between the local exchange and the access node to connect them and comprising at least two links (L), in which system a faulty signalling channel is switched over from a

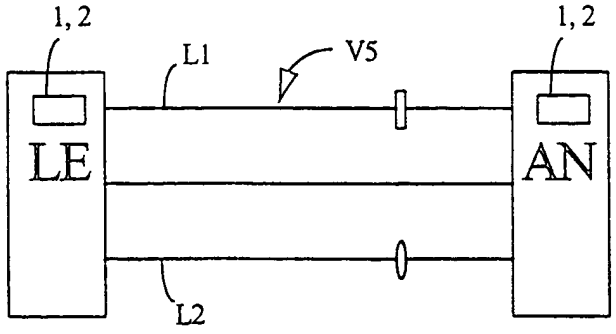
first link (L1) to a second link (L2), characterised in that the system comprises means (1) for preventing switch-over of any signalling channels until the V5 interface is in a normal operational condition, thus ensuring that, after the start-up of the V5 interface, both ends of the interface will be functioning in accordance with the same configuration setting.

6. System as defined in claim 5, characterised in that the system comprises means (2) for monitoring the interface during the start-up phase, and if a switch-over of signalling channels is initiated during start-up by the part of the V5 interface at the local exchange (LE) or by the part at the access node (AN), then, using the means for monitoring the start-up of the interface, channel switch-over at the other end of the V5 interface is prevented if it is not yet in a normal operational condition.

7. System as defined in claim 5 or 6, characterised in that the configuration parameter of the interface is the V5 interface Provision Variant parameter defined in the V5 specifications.

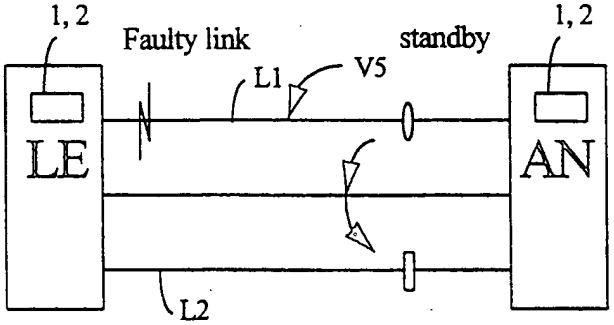
8. System as defined in claim 7, characterised in that, in restarting the V5 interface, the original Provision Variant parameter is used.

9. System as defined in any one of claims 5 - 8, characterised in that the V5 interface is a V5.2 interface consistent with the ETS 300 347 standard series.



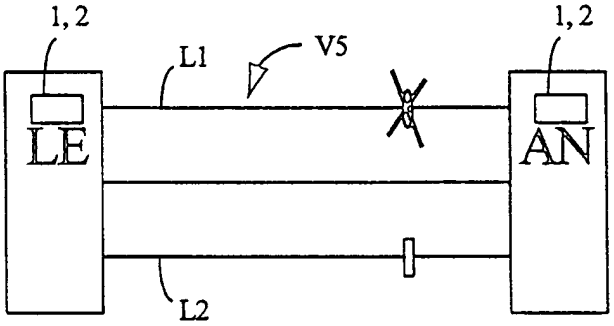
ORIGINAL SITUATION

Fig 1a



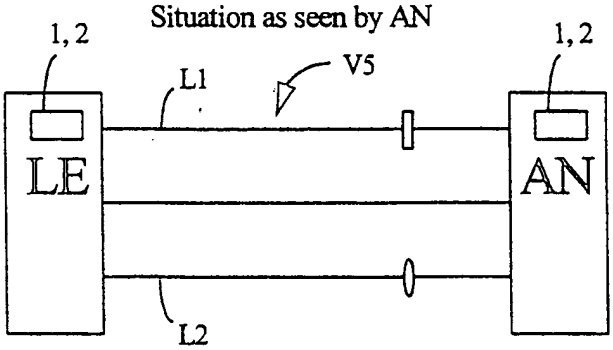
SITUATION AFTER APPEARANCE OF FAULT

Fig 1b



Situation as seen by AN

Fig 1c



Situation as seen by LE

Fig 1d

▯=ISDN signalling channel

()=standby channel

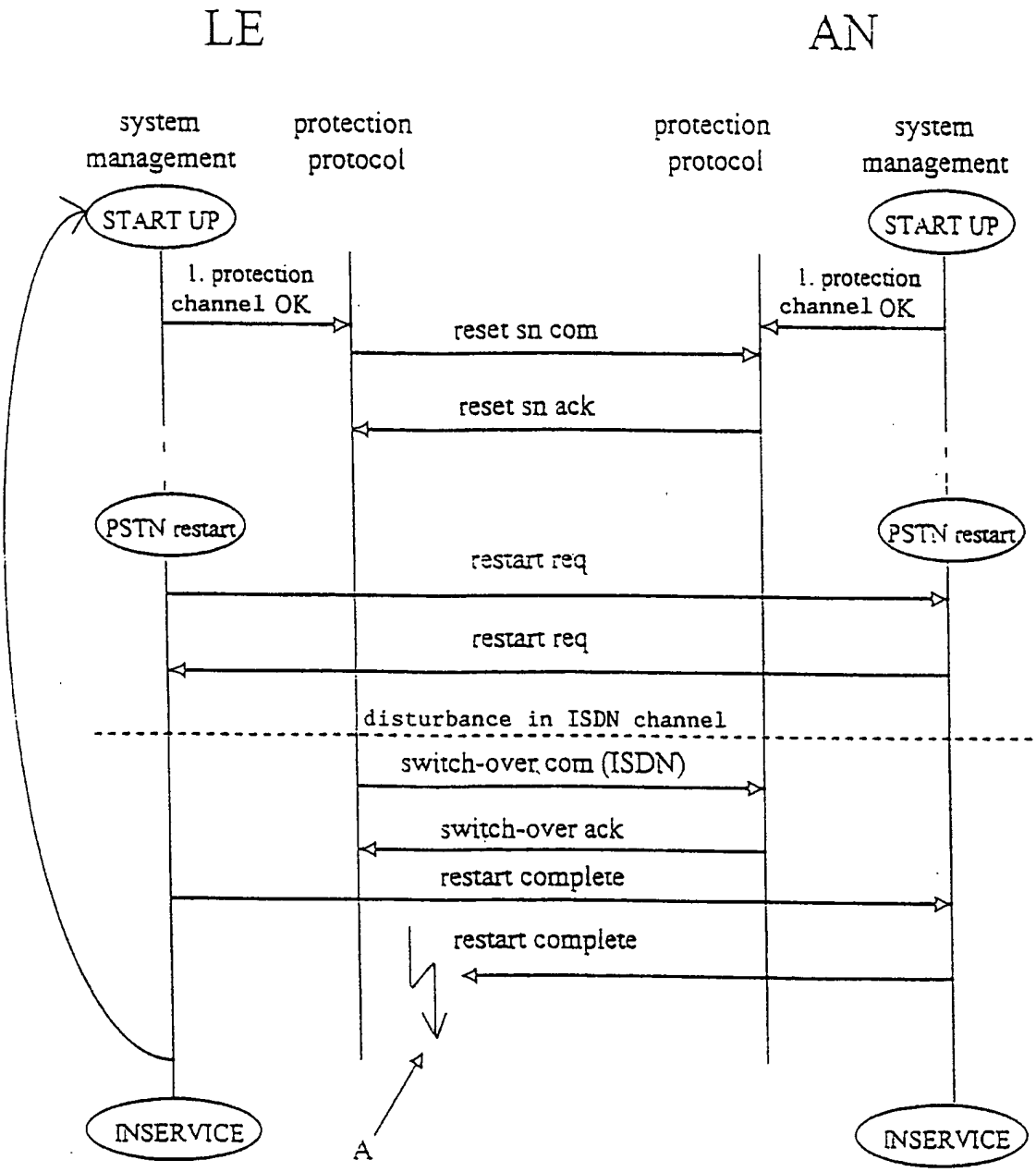

LE
AN
system management
protection protocol
protection protocol
system management
START UP
START UP
1. protection channel OK
1. protection channel OK
reset sn com
reset sn ack
PSTN restart
PSTN restart
restart req
restart req
disturbance in ISDN channel
switch-over com (ISDN)
switch-over ack
restart complete
restart complete
INSERVICE
A
INSERVICE

Fig 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 99/00265

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 11/04, H04Q 3/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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IPC6: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9809448 A1 (DIGITAL TECHNICS, INC.), 5 March 1998 (05.03.98), page 6, line 2 - page 7, line 5, claims 1-6 --	1-9
X	WO 9716936 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 9 May 1997 (09.05.97), page 3, line 10 - page 6, line 8, claims 1-30, abstract --	1-9
A	WO 9735404 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 25 Sept 1997 (25.09.97), page 1, line 12 - page 3, line 18 --	1-9

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9748224 A1 (NOKIA TELECOMMUNICATIONS OY), 18 December 1997 (18.12.97), page 1, line 3 - page 6, line 8 --	1-9
P,X	WO 9841037 A1 (NOKIA TELECOMMUNICATIONS OY), 17 Sept 1998 (17.09.98), page 4, line 17 - page 7, line 16, claims 1-7, abstract -- --------	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/08/99

International application No.
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